Phenomena of the Satellites of Jupiter and Saturn, and Occultations of Stars by the Moon, observed at Mr. Edward Crossley's Observatory, Bermerside, Halifax, in the year 1885, with the $9\frac{1}{3}$-inch Cooke Refractor.

By Joseph Gledhill, F.R.A.S.

Phenomena of Jupiter's Satellites.

(Power 240.)

Date.		Satellite.	Phenomena.		G.M.T.	N.A.	Remarks.
					h m s	h m s	
1885, Feb.	2	IV.	Ec. D.	Fading?	10 1 0	10 8 28	Poor definition.
				Fading	10 3 0		
				Half gone	10 6 30		
				Last seen	10 10 30		
		I.	Sh. I.	Just within	11 50 0	11 48 0	
		I.	Tr. I.	First contact	12 11 30	12 12 0	
				Bisection	12 13 30		
				Inner contact	12 15 30		
	3	I.	Ec. D.	Fading?	9 0 0	9 1 54	Misty.
				Fading	9 1 0		
				Just gone	9 2 30		
		I.	Oc. R.	Bisection	11 40 0	11 4 1	E. C. at telescope.
		II.	Ec. D.	Last seen	12 9 55	12 9 27	
	4	I.	Sh. E.	On disc	8 42 0	8 37 0	Bad sky.
		I.	Tr. E.	Just off	8 59 0	8 57 0	
	5	II.	Sh. E.	Just off	9 30 0	9 28 0	

Date.	Satellite.	Phenomena.		G.M.T. h m s	N.A. h m s	Remarks.
	II.	Tr. E.	Outer contact	10 10 0	10 8 0	
1885, Feb. 9	III.	Oc. R.	” ”	7 56 0	7 53 0	
17	I.	Ec. D.	Last seen	12 50 5	12 49 16	Some cloud.
	II.	Ec. D.	” ”	17 23 10	17 22 29	Some cloud.
18	I.	Sh. I.	Just within	10 7 0	10 5 0	Shadow not seen.
	I.	Tr. I.	” ”	10 7 0	10 6 0	
	I.	Tr. E.	Just off	12 27 0	12 25 0	Bad sky.
19	IV.	Ec. R.	First seen	8 41 30	8 41 52	
	I.	Oc. R.	Outer contact	9 35 0	9 34 0	
	II.	Tr. I.	” ”	11 39 0	11 38 0	
			Just within	11 41 0		
20	I.	Tr. E.	Inner contact	6 49 0	6 51 0	
			Outer contact	6 52 0		
25	I.	Tr. I.	On disc	11 57 0	11 50 0	Too late at telescope.
	I.	Tr. E.	Outer contact	14 10 0	14 9	Cloudy.
27	I.	Tr. E.	Inner contact	8 31 0	8 35	E. C. at telescope.
			Bisection	8 32 30		
			Outer contact	8 34 0		
	I.	Sh. E.	Inner contact	8 45 0	8 48	
			Bisection	8 46 0		
	IV.	Tr. I.	First contact	9 33 0	9 38 0	The satellite was nearly as dark as a shadow after $10^h\ 30^m$.
			Second contact	9 38 0		

Date.	Satellite.	Phenomena.		G.M.T. h m s	N.A. h m s	Remarks.
1885, Feb. 27	IV.	Sh. I.	Just within	11 31 0	11 34 0	
28	II.	Oc. D.	First contact	8 45 0	8 48 0	Fair sky.
			Half gone	8 48 0		
			Just gone	8 50 0		
	II.	Ec. R.	First seen	12 9 56	12 10 5	
			Half disc?	12 13 0		
			Full?	12 15 0		
Mar. 6	III.	Tr. E.	First contact	7 13 0	7 19 0	Fair definition.
			Half off	7 15 0		
			Outer contact	7 17 0		
	I.	Tr. I.	First contact	8 0 0	8 0 0	Bad sky now.
			Bisection	8 2 0		
			Inner contact	8 4 0		
	I.	Sh. I.	Bisection	8 22 0		
			Just within	8 25 0	8 23 0	
	III.	Sh. E.	Inner contact	8 42 0	8 50 0	
			Half off	8 46 0		
			Just off?	8 48 0		
	I.	Tr. E.	Bisection	10 17 0	10 20 0	Good definition.
			Last contact	10 20 0		
	I.	Sh. E.	First contact	10 41 0	10 42 0	Clouds pass and hide planet.

Phenomena of Saturn's Satellites.

(Power 240.)

January 6, 1885.—Good definition.

Enceladus, S.; very difficult; not up at 8^h, $8^h\ 5^m$, $8^h\ 10^m$, $8^h\ 15^m$, $8^h\ 17^m$, $8^h\ 20^m$ up? $8^h\ 25^m$ past? $8^h\ 30^m$ past.

Tethys, N.; definition poor; not up at $16^h\ 15^m$; up between $16^h\ 16^m$ and $16^h\ 17^m$ probably; $16^h\ 23^m$ past.

January 7.—Very good definition when the clouds clear away; high wind.

Dione, N.; $10^h\ 50^m$, $10^h\ 55^m$ not up; $10^h\ 58^m$ not quite up; $11^h\ 0^m$ on line? $11^h\ 5^m$, on line; $11^h\ 10^m$ past.

January 8.—Very good definition.

Enceladus, N.; reached the telescope too late to see the approach; on the line at $9^h\ 50^m$? $9^h\ 52^m$? $10^h\ 0^m$ past? $10^h\ 2^m$ past.

Tethys, N.; not up at $13^h\ 20^m$, $13^h\ 25^m$; up at $13^h\ 27^m$? $13^h\ 29^m$? $13^h\ 30^m$? past at $13^h\ 33^m$? $13^h\ 35^m$ past.

January 10.—Stormy; bright and clear occasionally

Tethys, N.; $10^h\ 45^m$ not up; $10^h\ 47^m$ up? $10^h\ 49^m$, $10^h\ 50^m$ up? $10^h\ 55^m$ past.

Enceladus, S.; very difficult object; on line at $11^h\ 0^m$? clouds now obscured the planet.

January 11—Windy; snow showers; often clear for a short time.

Tethys, S.; not up at $9^h\ 0^m$, $9^h\ 10^m$, $9^h\ 15^m$, $9^h\ 20^m$, $9^h\ 23^m$, $9^h\ 24^m$, $9^h\ 25^m$ up? $9^h\ 30^m$ $9^h\ 32^m$ up? $9^h\ 35^m$ past? $9^h\ 40^m$ past.

January 12.—Clear at intervals.

Dione, E.; $6^h\ 45^m$, $6^h\ 48^m$ not up? $6^h\ 49^m$, $6^h\ 50^m$ up? $6^h\ 52^m$ up? Clouds now came over.

Tethys, N.; difficult; $8^h\ 0^m$, not yet quite up. Cloud then hid the planet.

January 13.—Bad sky.

Tethys, S.; judged on line between $6^h\ 40^m$ and $6^h\ 50^m$; cloud and snow put an end to observation.

January 14.—Bad sky; could not see *Dione* steadily.

Dione, S.; $7^h\ 0^m$ not up; $7^h\ 5^m$ to $7^h\ 7^m$ up? $7^h\ 9^m$ $7^h\ 10^m$ up? $7^h\ 15^m$ up? $7^h\ 17^m$ past? $7^h\ 20^m$ past.

February 2.—Stormy; good light.

Dione, S.; $10^h\ 45^m$ to $10^h\ 47^m$ not up; $10^h\ 49^m$ to $10^h\ 53^m$ up? $10^h\ 55^m$ certainly not short of line; $10^h\ 57^m$ past? $10^h\ 58^m$ past.

February 3.—Misty; sat. very faint.

Tethys, E.; $12^h\ 15^m$ not up; $12^h\ 30^m$ past.

February 5.—Windy; wet; bright sky occasionally.

Rhea, N.; reached the Observatory too late for the approach; $9^h\ 50^m$ to $9^h\ 52^m$ up? $9^h\ 54^m$ to $9^h\ 55^m$ up; $9^h\ 57^m$ past? $9^h\ 59^m$ past.

Tethys, E.; $9^h\ 45^m$ to $9^h\ 47^m$ on web? $9^h\ 50^m$ past? $9^h\ 52^m$ past.

Enceladus, S.; glimpsed now and then; on web between $11^h\ 45^m$ and $11^h\ 50^m$.

February 7.—Stormy; often very clear.

Enceladus, E.; a very faint point of light suspected on or very near line at $6^h\ 5^m$.

Tethys, E.; $6^h\ 45^m$ to $6^h\ 50^m$ not up; $6^h\ 50^m$ to $6^h\ 57^m$ very nearly on line or quite so; $6^h\ 57^m$ to $7^h\ 0^m$ judged on line; probably past at $7^h\ 5^m$; certainly past at $7^h\ 10^m$.

February 9.—*Dione*, N.; $7^h\ 0^m$ not up; $7^h\ 2^m$ nearly up, $7^h\ 5^m$ on line? $7^h\ 8^m$ on line? $7^h\ 10^m$ past.

February 20.—*Tethys*, E.; $11^h\ 50^m$ not quite up; $12^h\ 0^m$ up? $12^h\ 5^m$ up? $12^h\ 10^m$ past.

Titan is now nearly at E. elongation.

February 22.—*Enceladus*, E.; suspected on line at 8 P.M.

Dione also.

Rhea, $8^h\ 40^m$ $8^h\ 42^m$ not up; $8^h\ 45^m$ $8^h\ 50^m$ up? $9^h\ 0^m$ past? $9^h\ 5^m$ past.

Tethys, just up at $9^h\ 12^m$; not up at $9^h\ 15^m$? $9^h\ 17^m$ to $9^h\ 25^m$ up? $9^h\ 30^m$ past.

February 25.—*Enceladus*, N.; on line at $8^h\ 45^m \pm$.

February 28.—*Dione*, N.; glimpsed occasionally; not on web at $10^h\ 45^m$; on between $10^h\ 50^m$, and $11^h\ 0^m$; past, at $11^h\ 5^m$.

March 7.—Good definition; *Dione*, S.; on web between $7^h\ 0^m$ and $7^h\ 10^m$; $7^h\ 15^m$ past.

March 9.—*Enceladus*, E.; extremely faint; $9^h\ 20^m$ up? $9^h\ 30^m$ past? $9^h\ 35^m$ certainly past. The sky clouded before *Tethys* reached the line.

March 11.—*Tethys*, E.; $8^h\ 50^m$ nearly up; $9^h\ 0^m$ up? $9^h\ 5^m$ past? $9^h\ 10^m$ past.

Dione, N.; $9^h\ 35^m$ nearly on line; $9^h\ 40^m$ and $9^h\ 45^m$ up? $9^h\ 50^m$ past? $10^h\ 0^m$ past.

March 12.—*Rhea*, E., easy; a little past at $10^h\ 20^m$.

Enceladus, N., very difficult; judged on line between $10^h\ 20^m$ and $10^h\ 30^m$.

March 13.—*Tethys*, E., cloudy often; on line about $6^h\ 40^m$.

Dione, E., between $11^h\ 40^m$ and $11^h\ 50^m$; planet low in W.; misty.

March 21.—*Tethys*, N. On the line $7^h\ 15^m$ to $7^h\ 20^m$? $7^h\ 25^m$ past.

Enceladus, S., faint; clearly seen, $8^h\ 10^m$ $8^h\ 15^m$ not up; $8^h\ 20^m$ $8^h\ 25^m$ up? $8^h\ 30^m$ past.

Rhea, E., badly seen; on line $11^h\ 30^m$ $11^h\ 34^m$.

December 15.—Good definition.

Tethys, S.; $9^h\ 42^m$ $9^h\ 47^m$ not up; $9^h\ 50^m$ nearly or quite up; $9^h\ 55^m$ still on line? $10^h\ 0^m$ past.

Lunar Occultations.

January 21, 1885.—B.A.C. 57; fair definition; power, 62; aperture, $9\frac{1}{3}$ inches.

Disappearance, $5^h\ 38^m\ 5^s$, G.M.T.
Reappearance, $6^h\ 48^m\ 33^s$ „
Nautical Almanac times, $5^h\ 39^m$ and $6^h\ 52^m$.

February 20.—38 *Arietis*, $0^h\ 5^m$, escaped occultation; never very near the Moon's limb.

February 22.—α *Tauri*; disappearance, $5^h\ 9^m \pm$; reappearance, $5^h\ 55^m\ 13^s$, G.M.T.

A New Form of Governor for the Driving-Clocks of Equatorials. By A. Hilger.

I have the honour of bringing before the Royal Astronomical Society a driving governor which I believe will prove of interest to those who consider uniformity of motion an important matter for an equatorial telescope, and especially to those engaged in the photography of the heavenly bodies.

In former years I have made a great number of Foucault's clocks, with the construction of which many Fellows will be well acquainted, and which twenty years ago were considered—as perhaps they are still, especially in France—the best form of driving-clock for an equatorial. My governor, so far as the fans are concerned, much resembles that of Foucault. A somewhat similar governor, but with three fans, was devised by the late M. Yvon Villarceau; besides these I do not know of any other fan governors, though such may undoubtedly exist.

But there were points in the Foucault governor with which I was by no means satisfied, especially the great complication of pieces and the great amount of friction, which all means error. I do not believe in any form of control which depends upon friction, and finding that, generally speaking, all driving-clocks are so controlled, I have worked out the present design, which is the result of years of experience. I do not think that any governor could have less friction while in action than this particular form, which I claim as my own invention. The friction is entirely confined to the four fine points which carry the two fans D and C. There is no other friction in the governing action whilst these are in motion.

In all forms of governors the clock is liable to go slower either when the fans or governor-balls close, or when the driving weight is reduced. It is not so with this form of clock; an addition of 140 lbs. more or less to the driving-weight will make no appreciable difference in the speed. The speed remains unchanged whether the fans are wide open or nearly closed; I say nearly closed, because, of course, as soon as the fans touch the spindle the control ceases.